4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

The environmental impacts generally associated with fishery management actions are effects resulting from (1) harvest of fish stocks which may result in changes in food availability to predators and scavengers, changes in the population structure of target fish stocks, and changes in the marine ecosystem community structure; (2) changes in the physical and biological structure of the marine environment as a result of fishing practices, e.g., effects of gear use and fish processing discards; and (3) entanglement/entrapment of non-target organisms in active or inactive fishing gear. A recent summary of the effects of the impacts associated with groundfish harvest on the biological environment are discussed in the final EA for the 2002 annual groundfish harvest specifications (NMFS 2001a). The SEIS (NMFS 1998a) and draft PSEIS (NMFS 2001c) analyzes the impacts of fishing over a range of TAC specifications.

This section analyzes alternative administrative procedures associated with implementing the harvest specifications.[5] An analysis of possible impacts from each alternative follow. Any environmental impacts of the actual TAC levels set using these administrative procedures would be determined each year when the EA is prepared for the annual harvest specifications for the groundfish fishery. Revising the annual harvest specification process will not affect NEPA compliance procedures. A draft EA on proposed harvest specifications would still be developed and made available for public review and comment. A final EA would be prepared annually prior to the approval of the final harvest specifications. The analyses would consider any change in fishing patterns or levels and the resulting impacts.

4.1 Impacts on Groundfish Species

Two types of analyses were done to compare the alternatives, retrospective evaluation and simulation modeling. Alternative 1 was used as status quo for purposes of comparing the effects of Alternatives 2 and 4. Alternative 3 was not separately analyzed because it was expected to have an effect between effects from Alternatives 1 and 2 because the time delay for using survey data is between the time delays in Alternatives 1 and 2. Alternatives 2 and 4 involve projecting ABC amounts one or two years into the future compared to Alternatives 1 and 3.

4.1.1 Retrospective evaluation

One simple approach to evaluating Alternative 2 was developed whereby assessment authors extracted ABC which was used as a proxy for TAC recommendations, as projected one year further than usual (e.g., an assessment presented at the December 2000 Council meeting would give 2001 recommendations as usual, and also 2002 projected recommendations). These values were compiled for four key stocks: Eastern Bering Sea (EBS) pollock, EBS/AI Pacific cod, Aleutian Island Atka mackerel, and GOA pollock, and compared with the status quo Alternative 1. The species selected reflect the true variability in assessment/ABC/TAC setting processes due to changes in stock assessment approaches and changes in management considerations. Except for EBS pollock, these species were also chosen because their ABCs were close to the TAC values. When EBS pollock has a high ABC, its TAC is usually restricted by the 2

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[5] An additional discussion of these analyses may be found in Section 5.10.

million OY cap. Mean catch and catch variability (expressed as coefficients of variability) were computed for Alternatives 1 and 2. Additionally, the annual average change in catch ($\overline{\Delta}$) was computed as:

$$\overline{\Delta} = \sum_{t=1}^{n-1} \frac{|C_t - C_{t+1}|}{C_t} (n-1)^{-1}.$$

This is a simple measure of how much year-to-year catch variability one can expect expressed as a percentage of the current year's catch. The impact of the BSAI 2 million mt OY was not considered in the analysis.

4.1.2 Simulation model

A second approach for evaluating the alternatives was developed using simulations. The purpose of the simulation study was to evaluate general patterns and trends for these alternatives. The current assessment information (compiled in 2001) was used to form the starting point for the simulations.

An extension of the single-species numerical simulation model (NMFS 2001c) used for all age-structured groundfish stocks was developed to evaluate Alternatives 2 and 4 relative to Alternative 1. Under Alternatives 2 and 4, the projected ABC estimates were those as computed from previous years. For example, under Alternative 2 in year *t,* the procedure was as follows:

1) Compute the fishing mortality associated with the ABC as computed in year *t-2*
2) Project abundance to year *t+1* and compute the fishing mortality associated with the ABC as computed in year *t-1;*
3) Project the population from *t+1* to year *t+2* assuming fishing mortality estimated from 2);
4) Compute the ABC value for year *t+2* using Amendment 56 harvest control rules. This ABC value is later used as the actual catch, e.g., as in steps 1) and 2).

Under Alternative 4, the procedure is the same but extended to reflect the increase in time horizon. Therefore the last two steps are :

4) Project the population from *t+2* to year *t+3* assuming fishing mortality estimated from 3);
5) Compute the ABC value for year *t+3* using Amendment 56 harvest control rules. This ABC value is later used as the actual catch, e.g., as in steps 1) and 2).

For Alternative 1, the ABC values were computed using the current procedures as outlined under Amendment 56.

For each species considered, a single time series simulation was conducted for 1,000 years. Because the primary interest in this analysis was a characterization of the different lag-times between the assessment and quota specifications, the alternatives were simulated for single long-time horizon (1,000) projections to minimize the impact of the phase-in period. For a given species, each alternative was simulated using the same random recruitment sequence.

In interpreting these results, the following factors need to be recognized:

1) These simulations fail to capture the effect of management interactions with other regulations and general bycatch issues.

2) The simulations begin with the assumption that we know precisely the current state of the populations considered.

3) The simulations do not reflect future (unknown) assessment estimation problems.

4) These simulations fail to anticipate the action that may be taken by the Council in establishing TAC in relation to ABC, which may reduce adverse effects. The Council has a history of recommending more conservative ABC and TAC levels as uncertainty increases. The actual catches are likely to be less than ABC shown.

5) The BSAI 2 million mt OY constraint was not used in this analysis.

6) For pollock, Pacific cod and Atka mackerel, the Steller sea lion protection measure harvest control rule was not accounted for in the model.

Diagnostics for evaluating the simulation results include: catches (assuming the full ABC recommendations would be harvested), full-selection fishing mortality rates, spawning biomass (females only unless otherwise indicated), annual average change in catch, the average age of the population, the frequency (similar to probability) that the catch will exceed the long-term expected $F_{40\%}$ catch level, the frequency that the spawning biomass will be above the B_{msy} level (assuming $B_{35\%}$ as a proxy), and the frequency that the fishing mortality rate exceeds the F_{OFL} level (as defined in Amendment 56). The first three results are presented as means with coefficients of variation. The others are presented as relative probability of population responses under the different alternatives. The frequency that the fishing mortality rate exceeds the F_{OFL} is presented as a relative indication only.

The simulation model predictions are based on future projections. Ideally, they would be validated using historical inputs for example, inputting known historical starting age structure and recruitment and then comparing simulation results with actual historical values of ABC.

A comparison of the mean levels of ABC generated by the simulation models with historical Plan Team ABCs suggests that, at least for pollock, the model predicts levels of ABC that are higher than those achieved historically. For EBS pollock, the average Plan Team ABC from 1991 to 2002 was 1.39 million metric tons. The Alternative 1 ABC, reflecting a similar TAC setting process, produced TAC estimates of about 1.5 million metric tons. The simulations for Alternatives 2 and 4, admittedly using a different TAC setting process, produced average ABCs of about 1.47 and 1.45 million metric tons. (Figure 4.1) Similarly, in the GOA pollock fishery, the average Plan Team ABC from 1991 to 2002 was about 105,000 metric tons. The simulation for Alternative 1 produced an average ABC of 162,000 metric tons. The simulations for Alternatives 2 and 4 produced estimates of about 145,000 and 136,000 metric tons. (Figure 4.2) These results suggest that the simulation results may be more useful as indicators of the direction of change from one alternative to another than of the absolute levels of ABC and harvest under an alternative.

Figure 4.1 EBS pollock TAC and ABC, 1980 to 2002, compared to mean Alternative 1, 2, and 4 ABC projections from the simulation model

Figure 4.2 EBS pollock TAC and ABC, 1980 to 2002, compared to mean Alternative 1, 2, and 4 ABC projections from the simulation model

4.1.3 Results and Discussion

For the retrospective analysis, it was not always possible to obtain an ABC recommendation under Alternative 2 in exactly the same way as under Alternative 1. In some years the ABC recommendation was revised (e.g., by the SSC) for the coming year but not the subsequent year, as would be required under Alternative 2. For example, in one projection for EBS pollock the Alternative 2 ABC was 1.54 million tons whereas for Alternative 1 it was 1.13 million tons. In some years for some stocks, it was not possible to project the Council recommendations explicitly and only the projected ABC levels were possible. In these cases, it may have been possible to exceed the 2-million ton cap for the BSAI, consequently, the realized hypothetical catches would have been lower.

With these caveats in mind, the results are presented in Figure 4.3 and Table 4.1-1. For the four stocks where retrospective examinations were possible, the pattern of recommended catch levels are quite similar under the two alternatives but with a regular lag. Under Alternative 2, the declines and increases often follow similar trends found in Alternative 1, but one year later. The variability of catch is greater for two out of the four stocks under Alternative 2, while the average annual change in catch is greater for all four stocks.

Similar patterns were observed for the simulation model results. The variability in catch generally increases under Alternatives 2 and 4 relative to Alternative 1 (Figs. 4.4-4.9; Table 4.1-2). The Gulf of Alaska pollock, BSIA Pacific cod (although only slightly), and Atka mackerel catch simulations under Alternative 4 were less variable than under Alternative 2. This was presumably due in part to the fact that, unlike the other stocks, these stocks are modeled with a steeply declining selectivity at the oldest ages.

Among the different stocks, the simulations revealed that the inherent life-history characteristics are an important factor in how stocks respond under different alternatives. Pollock, Pacific cod and Atka mackerel live to a maximum of approximately 20 years while Pacific Ocean perch may live to 90 years. All 4 of the relatively fast-growing, high natural mortality species (EBS and GOA pollock, Pacific cod, and Atka mackerel) were quite sensitive to Alternatives 2 and 4 while the effect on BSAI Pacific ocean perch was minimal. Sablefish was intermediate between these categories. While all stocks considered exhibit considerable recruitment variability, the impact of this variability on the exploitable stock is much more gradual for the longer-lived species. The average catch (and fishing mortality) is predicted to decrease under Alternatives 2 and 4, even though the probability of exceeding the OFL increases. This may seem contradictory. However, this characteristic is due to the effect of lagging information on the year class variability. I.e. having to substitute average values of recruitment instead of using available information on whether recruitment is going to be above or below average. The average biomass is also expected to increase under Alternatives 2 and 4; presumably this would be a benefit to predators. However, the model-predicted increase in population variability may impact on the predators. The magnitude of these potential impacts are unknown.

Under Alternative 1 (status quo), there is always uncertainty in stock status from which ABC and OFL recommendations are derived. The harvest control rules under Amendment 56 allow for a modest amount of error in the measurement of stock size without resulting in estimated ABC exceeding true OFL (assuming F_{msy} is estimated correctly = F). It is possible to unknowingly exceed the "true" OFL with Alternative 1 ABC recommendations. If OFL was exceeded on a long-term basis, the average stock sizes would be expected to be below B_{msy}. Such overfishing would have to be very drastic (i.e., much greater than our current OFL definitions) to result in stock sizes that would be unsustainable.

In general, it is difficult, if not impossible, to model the full process of setting TACs under these alternatives. The retrospective analysis approach taken here was to examine historical patterns in ABC recommendations under the Alternative 1 and (quasi) Alternative 2 scenarios. This approach reflects to some degree the full Council process but is limited in the number of applicable stocks and our ability to assess long-term expectations. For a more extensive analyses of how the population dynamics of the stocks would be affected, a simple simulation scenario was constructed which allowed comparison of more stocks and also Alternative 4. Under Alternatives 2 and 4, the variability in catch was expected to increase and the potential to exceed overfishing (as currently assessed) was expected to increase. In practice, these effects are likely to moderated somewhat by the Council and NMFS' tendency to recommend TACs that are less variable than ABC recommendations. Overall, it is likely that the TACs established under Alternative 2 or 4 will be less than the TACs under Alternative 1 as the Council and NMFS set TACs conservatively. Added variability with Alternatives 2 and 4 would likely be small in comparison to the natural environmental variability these fish populations already experience. It is unknown what significance this variability may have on prey abundance and if there may be any potential stress on ESA listed species.

The above analyses capture the effect of ABC specifications from the full Council-NMFS TAC setting process (i.e., in the empirical retrospective analysis) and the effect of how different stocks may behave under the different alternatives (i.e., in the simulation analyses). Another aspect remains where the *estimation* efficiency actually will change under the alternatives. That is, under the current Alternative 1 regime, the most recent survey data are used to forecast populations into the next year for setting quotas. These forecasts have a relatively high level of uncertainty about them. Under Alternatives 2 and 4 where the forecasts are further into the future, it is reasonable to expect that this uncertainty will increase. To illustrate this a stock assessment model was selected where the assessment uncertainty (which includes both measurement and, to some extent, process error information) is readily available for future years. The uncertainty (expressed as coefficient of variation) in forecasted EBS pollock spawning biomass based on different (constant) fishing mortality rates are as follows (based on model results from Ianelli et al. 2001):

Year	CV of spawning biomass with $F_{40\%}$	CV of spawning biomass with F_{msy}
2001	39%	39%
2002	43%	46%
2003	48%	81%
2004	59%	90%
2005	74%	93%
2006	82%	100%

This table shows how the uncertainty increases as the time to forecast increases. The difference between the results under the F_{MSY} and $F_{40\%}$ (constant) harvest rate scenarios is due in part because the F_{msy} is estimated with greater uncertainty than the $F_{40\%}$ (note that 2001 catch is pre-specified) and because the F_{msy} harvest rate is somewhat higher (resulting in a lower spawning biomass and hence higher CV). The impact that this would have in a practical, implementation sense would tend towards somewhat lower (on average) absolute catch recommendations. This is because under Amendment 56, fishing specified by an F_{msy} rate requires a "reliable" estimate of the uncertainty in order to compute the harmonic-mean value. Given that the harmonic mean value decreases as the uncertainty increases, the harvest rates projected further into the future are likely to be lower, reducing the frequency of exceeding the OFL.

An evaluation of the impact of Alternative 3 was not amenable to either the retrospective nor the simulation analyses. From a calendar year perspective, the *annual* catch levels would be specified to be the same as under Alternative 1. However, the timing of quota changes occurs from (effectively) December 31st - Jan 1st (under Alternative 1) to June 30th - July 1st (as under Alternative 3). The current assessments are based on calendar years and can retain the same data and model conventions. The computer code that performs standard projections for ABC recommendations will have to be modified slightly to provide projected values that reflect the quota-year (July-June). Note that this modification would also provide calendar-year catch values that may be useful for planning purposes. From a quota-year perspective, the 12-month catches (spanning July-June) will be slightly more variable than Alternative 1 and less variable than Alternative 2. Theoretically, this variability would fall half-way between Alternative 1 and 2 (as would the other variables of interest, e.g., biomass, catch, F etc.).

Figure 4.3 **Comparison of Alternatives 1 and 2 TAC (or ABC) recommendations for some key groundfish species in the North Pacific. Alternative 2 values were derived from historical stock assessment projections as done historically.**

Figure 4.4 **Simulated Eastern Bering Sea pollock trajectory showing the first 50 year of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in thousands of metric tons.**

Figure 4.5 **Simulated Aleutian Islands/Eastern Bering Sea Pacific cod trajectory showing the first 50 years of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in thousands of metric tons.**

Figure 4.6 **Simulated Aleutian Islands atka mackerel trajectory showing the first 50 years of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in metric tons.**

Figure 4.7 **Simulated Aleutian Islands/Eastern Bering Sea Pacific ocean perch trajectory showing the first 100 years of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in metric tons.**

Figure 4.8 **Simulated Gulf of Alaska pollock trajectory showing the first 50 years of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in thousands of metric tons.**

Figure 4.9 **Simulated sablefish trajectory showing the first 100 years of catches (top), fishing mortality rates (middle) and spawning biomass under different alternatives relative to some reference points. Catch and biomass are in thousands of metric tons, spawning biomass includes males and females.**

Table 4.1-1 Results from retrospective examination of past SAFE documents comparing alternatives 1 and 2. Coefficients of variation are shown in parentheses. Catch (=ABC recommendation) units are in thousands of tons.

	Alternative 1	**Alternative 2**
EBS Pollock		
Mean catch	1,299	1,266
	(15%)	(13%)
Avg. annual catch change	9%	10%
BSAI PCOD		
Mean catch	219	235
	(30%)	(37%)
Avg. annual catch change	29%	32%
Aleutian Islands Atka mackerel		
Mean catch	95	87
	(34%)	(37%)
Avg. annual catch change	14%	16%
GOA Pollock		
Mean catch	92	102
	(41%)	(34%)
Avg. annual catch change	31%	35%

Table 4.1-2 **Results from 1,000-year simulations comparing Alternatives 1, 2, and 4. Coefficients of variation are shown in parentheses. Catch and biomass units are in thousands of tons.**

EBS Pollock	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	1,498	1,474	1,448
	(32.8%)	(38.4%)	(39.0%)
Mean spawning biomass	2,643	2,717	2,784
	(27.4%)	(32.2%)	(35.5%)
Mean fishing mortality	0.337	0.322	0.320
	(14.1%)	(19.7%)	(27.9%)
Avg. annual catch change	13%	29%	32%
Avg. age (equil. F40%=2.27)	2.41	2.42	2.44
Freq catch > F40% catch	41.5%	39.9%	36.8%
Freq spawning biomass > B35%	64.4%	64.6%	65.4%
Freq F > FOFL	0.0%	9.1%	20.5%

BSAI Pacific cod	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	278	274	269
	(24.6%)	(26.8%)	(25.8%)
Mean spawning biomass	442	454	469
	(16.7%)	(20.2%)	(24.3%)
Mean fishing mortality	0.283	0.275	0.269
	(8.1%)	(14.2%)	(21.1%)
Avg. annual catch change	10%	19%	21%
Avg. age (equil. F40%=2.61)	2.68	2.69	2.71
Freq catch > F40% catch	45.4%	44.2%	40.6%
Freq spawning biomass > B35%	82.0%	79.7%	78.6%
Freq F > FOFL	0.0%	3.3%	14.9%

Aleutian Islands atka mackerel	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	98	88	84
	(41.3%)	(35.4%)	(28.8%)
Mean spawning biomass	128	146	153
	(27.3%)	(40.6%)	(42.4%)
Mean fishing mortality	0.317	0.294	0.288
	(13.5%)	(39.7%)	(49.2%)
Avg. annual catch change	24%	30%	24%
Avg. age (equil. F40%=2.52)	2.67	2.78	2.82
Freq catch > F40% catch	42.6%	29.8%	20.6%
Freq spawning biomass > B35%	68.0%	71.8%	74.0%
Freq F > FOFL	0.0%	25.7%	25.7%

Table 4.1-2 (cont'd).

BSAI Pacific ocean perch	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	16	16	16
	(11.2%)	(11.2%)	(11.4%)
Mean spawning biomass	142	142	142
	(7.4%)	(7.4%)	(7.6%)
Mean fishing mortality	0.047	0.047	0.046
	(4.2%)	(4.3%)	(4.6%)
Avg. annual catch change	2%	2%	2%
Avg. age (equil. F40%=9.91)	10.03	10.03	10.04
Freq catch > F40% catch	47.6%	47.8%	47.7%
Freq spawning biomass > B35%	97.1%	97.1%	96.8%
Freq F > FOFL	0.0%	0.0%	0.0%

Gulf of Alaska Pollock	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	162	145	136
	(54.8%)	(61.1%)	(56.8%)
Mean spawning biomass	251	289	311
	(38.6%)	(50.3%)	(54.0%)
Mean fishing mortality	0.275	0.242	0.232
	(18.3%)	(36.7%)	(45.6%)
Avg. annual catch change	20%	49%	45%
Avg. age (equil. F40%=2.68)	2.92	3.01	3.07
Freq catch > F40% catch	38.7%	29.2%	23.3%
Freq spawning biomass > B35%	56.4%	64.2%	66.9%
Freq F > FOFL	0.0%	21.1%	24.8%

Sablefish	**Alternative 1**	**Alternative 2**	**Alternative 4**
Mean Catch	26	26	25
	(36.5%)	(39.1%)	(39.2%)
Mean spawning biomass	225	231	238
	(26.2%)	(28.1%)	(30.0%)
Mean fishing mortality	0.120	0.115	0.111
	(13.4%)	(16.6%)	(20.6%)
Avg. annual catch change	9%	17%	20%
Avg. age (equil. F40%=5.27)	5.64	5.71	5.79
Freq catch > F40% catch	44.8%	43.0%	40.9%
Freq spawning biomass > B35%	65.8%	67.6%	69.3%
Freq F > FOFL	0.0%	0.0%	6.0%

4.1.4 Summary of Target Species Effects

The potential direct and indirect effects of the groundfish fisheries on target species are detailed in the draft PSEIS (NMFS 2001c). Direct effects include fishing mortality for each target species and spatial and temporal concentration of catch. Indirect effects include the changes in prey composition and changes in habitat suitability. Indirect effects are not likely to occur with any of the alternatives or the options analyzed because the proposed action does not change overall fishing practices that indirectly affect prey composition and habitat suitability. Potential direct effects are summarized below for each alternative.

Alternative 1. Status Quo

The Status Quo process is not likely to have adverse impacts on groundfish species beyond those analyzed in previous NEPA analyses (NMFS 1998a, 2001c, section 4.4). Alternative 1 differs from the other alternatives in the use of interim TACs at the beginning of the fishing year. Interim TACs make available only a fraction of the Council's proposed TAC, depending on the fishery (25 percent or first seasonal allowance). The 25-percent cap for interim TACs is an artificial constraint on the fishery which may have economic impacts (refer to Section 5.0) but is not likely to have negative environmental impacts, particularly for target species. The interim specifications are based on information from surveys conducted two year previously. The specifications for the current year fishery are not effective until approximately March of the fishing year. Therefore, even under status quo, a portion of the fishing year is conducted based on data approximately 18 months old. The analysis in this section does not reflect the potential effect of this lag or the potential effects of managing a fishery on an interim value.

Alternative 2. Proposed and final specifications before start of fishing year; option for biennial harvest specifications for GOA and BSAI species on biennial survey schedule.

Under Alternative 2, there is some evidence that year-to-year fluctuations in fishing mortality may increase, that average fishing mortality levels may fall, and that fishing mortality levels may have a tendency to inadvertently exceed OFL levels more often. Long term biomass is predicted to increase with the model results compared to Alternative 1.

Alternative 2 increases the lag between the time summer biomass surveys are conducted and the start of the year in which specifications based on that survey are implemented. Under Alternative 1, this lag is four months, under Alternative 2 it rises to 16 months. This increased lag means that a biomass level may have evolved (through recruitment, natural or harvesting mortality, or growth) by a greater amount before fishing takes place under Alternative 2 than under Alternative 1. The TAC may thus be less appropriate for a given biomass in any year under Alternative 2. If the biomass has dropped, the TAC may tend to be higher than it otherwise would have under Alternative 1, exacerbating the drop. If the biomass has risen, the opposite effect may take place. Thus, year-to-year fluctuations in biomass may be greater under Alternative 2 than under Alternative 1. Since harvest specifications are based on biomass estimates, fishing mortality for target species is also likely to become more variable. Analyses performed at the Alaska Fisheries Science Center, and reported in Sections 4.1.3 and 5.10 of this EA/RIR/IRFA provide some support for this proposition, especially for species that have relatively short life spans.

In part because of the increased variability, mean annual fishing mortality is expected to be lower under Alternative 2 than under Alternative 1. The increased variability means that annual biomass levels may trigger harvest control rule induced reductions in harvest rates more often. This may lead to lower fishing mortality in more years than under Alternative 1, and lower mean fishing mortality overall. Moreover, other uncertainties, some connected with avoiding OFLs (discussed below), may also lead to more conservative harvest rates. The analyses performed at the Alaska Fisheries Science Center also provided some support for this result.

The increased variability in the mean annual biomass is also expected to increase the possibility that managers may inadvertently exceed OFLs. This possibility currently exists under Alternative 1, but based on simulations, it would be greater under Alternative 2. In consequence, managers may set harvest specifications in a more conservative manner under Alternative 2 in order to reduce the likelihood of this result. It is possible that the increased probability of exceeding the OFL may be dampened by conservative setting of TAC.

The simulation analysis indicates that the average catch is likely to be lower under Alternative 2 and 4 compared with Alternative 1. This is likely underestimated since the analysis did not take into account extra measures in the TAC setting process that would lead to having the total groundfish TAC fall within the 2 million mt OY cap. The added stock status uncertainty for Alternatives 2 and 4 is likely to lead to additional quota reductions under Amendment 56 harvest control rules (e.g. under Tier 1, the higher the uncertainty, the lower the ABC). Response to population changes will be slower under Alternatives 2 and 4 resulting in increased variability in catch and biomass.

Based on the analyses, Alternative 2 appears likely to lead to lower harvest mortality, greater year-to-year fluctuations in harvest mortality, and an increased possibility of exceeding OFL levels; the sizes of these impacts are unknown. The potential increase in biomass over time may have a beneficial effect on target species but there may also be short term negative effects with the higher potential expected for exceeding the OFL. The analyses did not account for the Council process in establishing TAC, therefore the model results can only be used to indicate general trends in the absence of Council action. Because of the importance of Council process in establishing harvest specifications, we are unable to determine the significance of these model results.

This alternative will not have an effect on the spatial or temporal harvest of target species.

For the potential effects of the option to Alternative 2, see the results below for Alternative 4.

Alternative 3. Issue Proposed and Final Specifications Based on an Alternative Fishing Year Schedule.
Option 1: Set sablefish TAC on a January through December schedule
Option 2: Reschedule the December Council meeting to January

Alternative 3 may cause fishermen to change their fishing behaviors. For example, fishermen may choose to fish conservatively early in the [new] quota fishing year in order to “save up” PSC limits and TAC and maximize their returns during the winter high value roe fishery. Real-time tracking and co-operation among fishery participants might mitigate the possible economic impacts and minimize changes in fishing patterns, which could mitigate the possible environmental impacts. Greenland Turbot and sablefish fisheries may be the most likely to be impacted because their directed fishing season overlaps with the July 1 quota fishing year date. See Tables 5.9-2 and 5.9-3 for fishery specific information. Sablefish issues are also covered in detail in section 4.9.

In addition, a slight lag in using "the most current information" would be introduced under this Alternative. However, this lag will have no impact on the calendar year catch expectation (from the standpoint of ABC recommendations). This alternative will have quota changing between June and July as compared with status quo where changes occur between December and January. In addition, a change in the quota fishing year will require stock assessment model projections to be modified slightly. However, the current model structure can remain the same.

Table 4.1.3 shows how ABC would be calculated and apportioned under Alternative 3 compared to Alternative 1, for a fishery with a 60% January through June A seasonal apportionment. Assume that the ABC is used as TAC for the fishing year for purposes of the seasonal apportionment. The first four columns provide the background information that is used in the calculations. Each row represents one year of harvest specifications process. This table should be read across the rows to understand the difference in seasonal apportionment between the alternatives. Column 1 in Table 4.1.3 shows a hypothetical Year 1 ABC projection in metric tons for this species. This projection would have been made at the Plan Team meetings in November of the preceding year for the oncoming calendar year (Year 1). Column 2 shows Year 2 ABC projections that would have been made at the same plan team meetings for the year after the oncoming calendar year (Year 2). Column 3 is simply half of the Year 2 ABC projection. Column 4 shows the A season apportionment in the first 6 months of the Year 1 (with the first cell being an assumed value). This amount is subtracted from the Year 1 ABC so that the remaining amount of ABC is applied to the July-December part of the fishing year. This amount is then added to half of the Year 2 ABC to get the full year's ABC for the July through June time period. Column 5 shows the actual calculation of the ABC for the July of Year 1 to June of Year 2 fishing year.

The A seasonal apportionments for the July to June fishing year (Column 6) are set at 60% of the July - June ABC (from Column 5). For Alternative 1, the A seasonal apportionment for the same January through June time period is 60 percent of the Year 2 ABC projection. Columns 6, 7, and 8 compare "A" season (January to June) apportionments under Alternatives 1 and 3. Column 6 shows the "A" season apportionment under Alternative 3. This is equal to 60% of Column 5. Column 7 shows the "A" season apportionment under Alternative 1. This is equal to 60% of Column 2 (the Year 2 ABC). Column 8 is the difference (the Alternative 3 apportionment minus the Alternative 1 apportionment).

Table 4.1.3 shows that there will be a lag between changes in biomass and the setting of seasonal apportionments under Alternative 3, which will likely lead to seasonal apportionments different from those resulting under Alternative 1. Reading across the rows, during periods of falling biomass between Year 1 and Year 2, Alternative 3 is likely to have a higher seasonal apportionment than Alternative 1. Conversely, during periods of rising biomass between Year 1 and Year 2, Alternative 3 is likely to have lower seasonal apportionments than Alternative 1.

Table 4.1-3 Seasonal Apportionment Comparison of Alternative 3 and Alternative 1.

1	2	3	4	5	6	7	8
Yr. 1 ABC projection (mt)	Yr. 2 ABC projection (mt)	+ 50 % Yr. 2 ABC = (Col. 2)/2 (mt)	Previous A season appor. = Col.6 year $_{(x-1)}$ (mt)	July -June ABC = (1-4)+3 (mt)	Alt. 3 A season Apportionment =60 % of col. 5 (mt)	Alt 1 A season apportionment = 60 % of Col. 2 (mt)	Difference = 6-7 (mt)
1200	1400	700	assume 720	1180	708	840	-132
1400	1000	500	708	1192	715 t	600	115
1000	5000	2500	715	2785	1671	3000	-1329
5000	3000	1500	1671	4829	2897	1800	1097
3000	3000	1500	2897	1603	962	1800	-838
3000	3200	1600	962	3638	2183	1920	263
					total = 9844	total = 9960	total = -116

Because it is difficult to predict a potential shift in fishing behavior, it is unknown if Alternative 3 may have an effect on the temporal harvest of target groundfish species. However, it is unlikely that this alternative will be appreciably different from status quo since the annual *calendar year* catches will be essentially identical (with some variability increase between first and second halves of a calendar year). Regarding seasonal allocations, these would be based on the new quota year. For example, if it was considered desirable for 60% of the quota to be allocated to the period July-December, then 40% of the quota year value would be specified for the subsequent year during Jan-June. Harvest levels may be higher and variability lower for Alternative 3 compared to Alternative 2 or 4 because the time lag between data and fishery implementation is less for Alternative 3 compared to Alternatives 2 and 4. It is not possible to fully predict the annual actions that may be taken by the Council and the level of conservation exercised in setting annual harvest specification. It is possible that the Council may conservatively set TAC for target species and species groups, reducing the potential for overfishing due to the variability of biomass data. The effect of this alternative on direct fishing mortality for target species is unknown.

Option 1 to Alternative 3 to set the sablefish TAC for the following January through December time period would allow the sablefish IFQ fishery to be managed with the halibut IFQ fishery. The simulation model indicated that the effect of projecting ABC on sablefish biomass and future harvest is minimal compared to Alternative 1, therefore projecting ABC levels to the following year is not likely to have an impact on sablefish stocks.

Option 2 would allow additional time for the stock assessment scientist to examine data and write reports for Council consideration. This may have a beneficial effect for target species because of the potential improvement in the quality of the assessments which may lead to better management of the stocks. However, this potential improvement is difficult to quantify.

Alternative 4. Biennial harvest specifications

In Alternative 4, the TACs set by the Council for the future years will be based on two year projections from the SAFE reports. As with Alternatives 2 and 3, this has an advantage over interim TACs used under Alternative 1 by basing the TACs on a scientifically derived value rather than an administrative adoption of a percentage of the previous year's TAC. This alternative does not use the most recent catch data for modeling to establish future TACs, which may lead to less accurate ABC projections and possibly less effective management of the groundfish stocks.

In the simulation model above, Alternative 4 has similar effects as Alternative 2 with the variability in catch increased somewhat over Alternative 2 and even more over Alternative 1. Average catch is expected to be lower than under Alternative 2 and the probability of exceeding the overfishing level is expected to be greater. As explained above for Alternative 2, some of this potential effect, may be reduced by conservative recommendations of TAC by the Council, especially for the short-lived species.

Alternative 4 would not allow use of winter pollock biomass distribution survey data collected in the BSAI Bogoslof and GOA Shelikof Strait during the current year. For instance, a winter survey in 2000 would be used for 2002 and 2003 harvest projections. Winter surveys in 2001 and 2002 would be used for harvest projections for 2004 and 2005. With setting TAC for two years, the annual biomass distribution survey results will be used every two years. This is not as much of an issue for the Bogoslof TAC since it is historically set at a level that allows bycatch only. The Shelikof Strait TAC allows for directed pollock fishing. Setting a two year TAC for pollock may not be the most desirable method of managing because of the annual variability of recruitment and the high level of exploitation in the Bering Sea. There is less ability to annually adjust the harvest specifications based on recent catch data, or in the case of the Bogoslof and Shelikof Strait, adjust based on annual winter biomass distribution data. Because of these conditions of the fishery, there is more potential to exceed overfishing levels if TAC was set near the ABC value.[6]

A number of the tier 1-4 target species may have catch information available during the time period between the first and second year TAC. Tier 5 and 6 species will not likely have new information available that could be used in adjusting TAC. New catch information for the tier 1-4 species would not be used while the first and second year TACs are in place. This likely is not a problem since the catch projections used for the tier 1-4 species generally are fairly close to the actual catch amounts realized by the fisheries. Updating the TAC with the new actual catch data is unlikely to make a large difference between the TAC

[6] Gary Stauffer, Director of Resource Assessment and Conservation Engineering Division, Personal communication. February 22, 2001, NMFS, WASC, Route: F/AKC2, BLDG: 4, RM: 2121, 7600 SANDPOINT WAY NE, SEATTLE, WA 98115-6349

based upon catch projections vs the TAC based upon actual catch data[7]. If this difference is not significant, it may not be appropriate to initiate the process to change the TAC.

For demersal shelf rockfish, biennial submersible line transects are conducted to determine the standing stock. The State of Alaska performs these surveys and provides the information during the November Plan Team meeting recommending the ABC for the following year. Under Alternative 4, the State would need to provide a projection of the ABC for year 2. Currently, the State does not do population modeling for this target species group and has no future plans to do such modeling.[8] For these reasons, the demersal shelf rockfish should not be included in the biennial harvest specifications process under Alternative 4. Separate annual rulemaking may be necessary for this species alone, making the harvest specifications process under this alternative less efficient.

As with Alternative 2, because it is not possible to know what the future recommended TAC levels may be in comparison to the OFL, it is unknown what effect this alternative may have on target species fishing mortality. It is likely that average TACs will be lower and biomass higher under this alternative compared to Alternative 1 and Alternative 2 as the Council makes conservative recommendations to stay below OFL. The potential increase in biomass over time may have a beneficial effect on target species, but there may also be short term negative effects with the higher potential expected for exceeding the OFL. Because of the importance of Council process in establishing harvest specifications, we are unable to determine the significance of the simulation model result for Alternative 4.

This alternative will not have an effect on the spatial or temporal harvest of target species because there is no change in the fishing year or in the location of harvest.

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Options 1 and 2 to this alternative would have no effects on groundfish species since they apply only to the setting of PSC limits.

Option A. Abolish TAC Reserves.

This option is an administrative change to accommodate the practice of releasing nonspecified TAC reserves for the fisheries. Implementation of this option would have no impact on the groundfish target species that differs from the status quo. Given that Option A addresses TAC reserves as a subset of the TAC that is assumed to be available for harvest, the impacts are assessed annually in the analyses that accompany final harvest specifications.

In the past 12 years, only a BSAI flatfish reserve has been released once to allow a harvest amount over the TAC but less than the ABC. The amount of harvest that year did not reach the TAC because of halibut

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[5]Michael Sigler, Mathematical Statistician. Personal communication. February 22, 2001, NMFS, Auke Bay Laboratory, 11305 Glacier Highway , Juneau , AK 99801-8626

[8]Dave Carlile, Biometrician, Personal communication. February 22, 2001, Alaska Dept. of Fish and Game. Alaska Department of Fish and Game, Division of Commercial Fisheries, 1255 W. 8th Street, Juneau, AK 99801

bycatch mortality, the same constraint that is experienced every year by this fishery. The release of the reserves has no effect on the higher volume groundfish fisheries.

Table 4.1-4 Effects of Alternatives 1 through 4 on Target Species

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Option: Abolish Reserves
Direct Effects					
Fishing Mortality	N	U	U	U	N
Spatial/Temporal concentration of Catch	N	N	U	N	N
Indirect Effects					
Prey composition	N	N	N	N	N
Changes in Habitat Suitability	N	N	N	N	N

U = unknown
N = no effect

4.2 Effects on Species Prohibited in Groundfish Fisheries Harvest

Catches of Pacific halibut, crabs, salmon, and herring are controlled by PSC limits for the BSAI that are established in regulations as part of the annual specification process. The Council recommends annual GOA Pacific halibut PSC limits for gear types, and further seasonal and fishery target allowances. Additionally as part of the annual specification process the Council recommends apportionments of BSAI PSC limits among seasons and fishery targets. Section 4.3.5 of the SEIS (NMFS 1998a) and the draft PSEIS (NMFS 2001c) analyzes the impacts of fishing over a range of TAC specifications and compares them to impacts of status quo fishing on prohibited species. Each year the final EA for the annual groundfish harvest specifications analyzes the impacts of TAC alternatives on prohibited species.

The final EA prepared for the action of setting the 2002 TACs for the groundfish fisheries off Alaska analyzed the effects of setting the 2002 TACs over a range of levels on prohibited species in section 4.4 (NMFS 2001a). The direct and indirect effects analyzed were the impact of incidental catch of prohibited species in the groundfish fisheries on stocks of prohibited species, the impact of incidental catch of prohibited species in the groundfish fisheries on the harvest levels of those species in their respective directed fisheries, and the effect on levels of incidental catch of prohibited species in the groundfish fisheries. The effects on prohibited species were all determined to be insignificant over a wide range of TACs, except for Alternative 5 which would have set TACs at zero (no fishing for groundfish) and would have resulted in a significant decrease in the levels of incidental catch of prohibited species in the groundfish fisheries (NMFS 2001a). An additional indirect effect of the groundfish fisheries is a potential change to the prey composition as analyzed in the Steller sea lion SEIS (NMFS 2001b) and found to be insignificant for the alternatives analyzed. The significance of the impacts in these analyses were dependent on the level of removals of prohibited species biomass. The alternatives analyzed here are not believed to have an impact on prohibited species not already considered because they do not effect the manner in which TACs or PSC limitations are set, rather the alternatives analyzed here are procedural in nature and would not be expected to change the amount of prohibited species or prey species harvested.

Alternative 1. Status Quo.

Under the status quo, 25 percent of the previous year's PSC limits and fishery apportionments thereof are made available during the interim period, until final specifications are published in the Federal Register. This does not have any adverse impacts on prohibited species unless the annually specified PSC limits are reduced significantly, by more than 75 percent. Therefore, the status quo allocation of 25 percent of the PSC limits as an interim measure "protects" against excessive harvesting of prohibited species. This alternative has no impact on the manner in which prohibited species and PSC limits are established and managed and therefore has no additional direct, indirect, or cumulative impacts on prohibited species not already considered.

Alternative 2. Proposed and Final Specifications before start of fishing year
Option for biennial harvest specifications for GOA and BSAI species on a biennial survey schedule.

Alternative 2, either with or without the option, is not likely to affect the bycatch of prohibited species. Proposed and final specifications, including PSC limits, would be finalized under this alternative before the fishing year started, with the potential for better management of PSC over the status quo. The potential for improvement of PSC management is due to the removal of the limitation of 25 percent of the annual PSC limits during the period the interim specifications are in effect. The Council could then recommend a lesser or greater amount of the annual PSC limit at the beginning of the fishing year during which the interim specifications are normally in effect, depending on the bycatch needs of the directed groundfish fisheries. NMFS does not believe that this would necessarily result in an overall decrease in the annual amount of PSC bycatch, but rather that the same amount of bycatch could be used to harvest a greater amount of the available groundfish resources.

Annual PSC limits for crab in the BSAI are based on a percentage of the estimated abundance (numbers) of crab and annual PCS limits in the BSAI for herring are based on a percentage of estimated spawning biomass (mt). At present these estimates are not available until October or November of the year as is the case with groundfish stock assessments. Thus, the Council's final action on PSC limits in April would be based on the previous year's assessment of crab abundance and spawning biomass of herring. ADF&G has stated that estimates of spawning herring biomass cannot be forecast[9], while the abundance (numbers) of crab estimated

[9]Personal communication with Fritz Funk, Statewide Herring Biometrician, January 24, 2001, Alaska Department of Fish and Game, Division of Commercial Fisheries, 1255 W 8th St., Juneau, AK 99801

by the NMFS trawl survey can vary by 30 percent from one year to the next.[10] The impact of using the previous year's assessment of these stocks for establishing PSC limits on crab and herring stocks is negligible because the PSC limits are by regulation set at extremely low levels; 1 percent of the estimated spawning biomass in herring (in mt) and between 0.1 percent and 2.5 percent of estimated crab abundance (in numbers). This alternative would have minor impacts as described on prohibited species stocks by the manner in which PSC limits are established and managed. Annual PSC limits are not impacted by this alternative and therefore Alternative 2 has no additional direct, indirect, or cumulative impacts on prohibited species not already considered.

Alternative 3. Issue Proposed and Final Specifications Based on an Alternative Fishing Year Schedule.
Option 1: Set sablefish TAC on January through December schedule.
Option 2: Reschedule the December Council meeting to January

Under Alternative 3 the fishing year would begin in July. Proposed and final specifications, including PSC limits, would be finalized under this alternative before the fishing year started. The discussion of the potential benefits of eliminating the 25 percent limit on the annual PSC caps during the period the interim specifications would have been in effect under Alternative 2 would also apply under Alternative 3. As discussed under Alternative 2, biomass estimates of the crab and herring stocks would continue be to updated in October and November. The annual PSC limits for crab and herring would presumably be available over the entire fishing year without adjustments based on new biomass estimates available late in the first half of the fishing year (November), these new estimates however would be the basis for establishing the next year's PSC limits.

It is not known how a change in the opening date of fishing would impact fishing practices such as the amount of effort directed at specific groundfish targets over time and space during the fishing year. The seasons for Atka mackerel, pollock, Pacific cod, rockfish, sablefish (normally concurrent with the Pacific halibut fishery dates) and Greenland turbot are already established by regulation. Since many fisheries are constrained by PSC limits during the course of the year, the manner in which the Council apportions PSC allowances to the gear types over the course of the year by season and fishery target could have the effect of preserving current fishing practices or deliberately altering them. NMFS does not believe that this would necessarily result in an overall decrease in the annual amount of PSC bycatch, but rather that the Council would apportion PSC limits to optimize the harvest of the available groundfish resources. Option 1 to set sablefish TAC on a January through December schedule will keep the halibut and sablefish IFQ fisheries on the same schedule, eliminating any potential increases in halibut bycatch if the sablefish fishery is on a different schedule. Option 2 is unlikely to have any effect on prohibited species since the additional time for analysis will likely be concentrated on target species.

It is likely that the BSAI pollock A season end date and B season beginning date of June 10 will need to be changed to July 1 so that the seasons are not truncated by the fishing year. The June 10 date for this seasonal end point was part of the Steller sea lion protection measures. If the date is changed, there is the

[10] Personal communication with Dr. Robert Otto, Director NMFS RACE lab, March 7, 2002, 301 Research Count, Kodiak, AK 99615.

potential for the pollock fishery to experience higher salmon bycatch rates as the industry pushes fishing effort into the later part of the year. Lower salmon bycatch rates are experience in June compared to October. The average pollock harvest during the June 10 through July 1 time period for 2001 and 2002 was 35, 896 mt. If the harvest of this amount of pollock was made up during October when the bycatch rates are high (ave. .25 during October 2001), the number of additional chinook salmon bycatch may be up to 5,815 salmon.[11] The potential additional amount of bycatch could be reduced if the industry was able to limit the amount of harvest in October, especially towards the end of the month. Whether there would be an effect on the amount of salmon bycatch is dependent on the actions of the industry and therefore the effects on Alternative 3 on salmon bycatch is unknown. This alternative will have no effect on the salmon PSC management measures currently in regulations.

Alternative 3 would have a greater impact on the manner in which annual PSC limits are apportioned and managed throughout the fishing year than the other alternatives considered. Annual PSC limits are not impacted by this alternative and therefore Alternative 3 has no known additional direct, indirect, or cumulative impacts on prohibited species not already considered.

Alternative 4. Biennial harvest specifications.

Option 1: Set PSC limits annually

Option 2: Set PSC limits every two years based on regulations and projected values or rollover from previous year.

After the first year, when the annual OFL, ABC, and TAC levels together with PSC limits would be established by emergency rule, Alternative 4 would follow the same schedule as Alternative 2 for completion of the SAFE reports, Council action, public comment, and proposed, and final rule making. PSC limits for crab and herring under Alternative 4 Option 1, like Alternative 2 would be based on the previous year's assessment and the discussion of impacts on prohibited species under Alternative 2 would apply here. Annual PSC limits are not impacted by this alternative and therefore Alternative 4 Option 1 has no additional direct, indirect, or cumulative impacts on prohibited species not already considered.

Option 2, using projected values, would require that for crab and herring stocks in the BSAI that NMFS and/or the State provide projections of crab and herring biomass one to two years in advance. At this time it is not known if the State and NMFS have the resources or data available to make reliable abundance and spawning biomass projections for the crab and herring stocks. Provided that such stock projections are practical, annual PSC limits under Alternative 4, Option 2 have no additional direct, indirect, or cumulative impacts on prohibited species not already considered.

However if such stock projections are not practical then NMFS recommends that Option 2, using projected values, be withdrawn from further consideration. While Option 2, (rolling over the previous years PSC limits) would not be expected to adversely impact the stocks of prohibited species, but regulations at §679.21(d) and (e) specify that PSC limits in the GOA and BSAI shall be specified annually and be based on estimates of numerical abundance of crab and spawning biomass of herring in the BSAI. This regulation

[11] NMFS Inseason Management salmon bycatch data from www.fakr.noaa.gov/2001/bysalb.txt.

would need to be changed to allow for biennial PSC specifications if Option 2 was selected, but this would not solve the need to set crab and herring PSC limits based on spawning biomass which, with current resources, is only done annually. For this reason NMFS recommends that Option 2, rolling over PSC limits from the previous year, be withdrawn from further consideration.

Option A. Abolish TAC Reserves

This alternative has no impact on prohibited species bycatch, direct, indirect, or cumulative since it only involves an administrative process to remove the need to establish nonspecified TAC reserves in the BSAI and specified reserves in the GOA.

Summary of Effects on Prohibited Species

Table 4.2-1 Effects of Alternatives 1 through 4 on Prohibited Species

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Option: Abolish Reserves
Incidental Catch of Prohibited Species on Prohibited Species Stocks	N	N	N	N	N
Harvest Levels in Directed Fisheries Targeting Prohibited Species	N	N	N	N	N
Harvest Levels of Prohibited Species in Directed Groundfish Fisheries	N	N	U*	N	N
Prey composition	N	N	N	N	N

N = No effect
U = Unknown
* Due to potential salmon bycatch in the BSAI pollock fishery.

4.3 Forage Species and Nonspecified Species

Direct effects of the groundfish fisheries on forage species and nonspecified species are similar to potential direct effects on prohibited species. Groundfish fisheries remove from the environment forage species and nonspecified species as bycatch. Indirect effects of the groundfish fisheries on forage and nonspecified species include potential changes in prey composition. Because of the lack of data regarding the life history and biomass of the forage and nonspecified species, it is difficult to determine the effects of such removals on these species. Section 4.5 of the draft PSEIS (NMFS 2001c) contains effects information on forage and nonspecified species at a range of harvest management alternatives.

Because the proposed action is the modification of an administrative process for annual harvest management, no direct, indirect or cumulative effects on forage and nonspecified species are expected with this action.

4.4 Effects on Marine Mammals, Sea Birds, and Species Listed as Threatened or Endangered Under the ESA, except Steller sea lions.

The effects of groundfish harvest at various TAC levels on marine mammals, including ESA listed species, are discussed in section 4.2 of the draft PSEIS (NMFS 2001c). Causal relationships between commercial harvesting of groundfish in the EEZ off Alaska and the population status and trends of marine mammals have not been established. The complexity of potential interactions at multiple temporal and spatial scales that might affect foraging behavior, coupled with the paucity of data available to characterize those relationships, inherently limit detection of fisheries effects. Thus, the mechanisms by which fish biomass removals might translate to marine mammal fitness or mortality are largely unknown at this time. The alternatives analyzed in this EA/RIR/IRFA will not change significantly the mechanisms for fish biomass removal and therefore will not likely have any effects on marine mammals beyond those already described in the PSEIS.

Groundfish harvest effects on seabirds, including ESA listed species, are described in section 4.3 of the draft PSEIS (NMFS 2001c). The direct effect is incidental take and the indirect effects include prey availability, benthic habitat disturbances and processing waste and offal discharge. The change in the harvest specifications administrative process will have no effects beyond what is described in the PSEIS because there will be no changes in fishing practices that would alter the direct or indirect effects listed.

ESA listed steelhead have not recently occurred in the BSAI or GOA so no impact is anticipated for this species by any alternative in this EA/RIR/IRFA. ESA listed salmons are directly impacted by the groundfish fisheries through incidental catch. It is unknown whether they may also be indirectly affected by the groundfish fisheries from spatial or temporal concentration of bycatch or prey competition. Because PSC limits are established by regulation each year for salmon and the alternatives do not affect the PSC limits, none of the alternatives is expected to have an impact on ESA listed salmon beyond those identified in the draft PSEIS (NMFS 2001c).

Revising the process by which harvest specifications are established, and eliminating TAC reserves are not expected to affect ESA listed species, marine mammals or seabirds in any way not considered in previous consultations and environmental analyses. The exception may be for Steller sea lions which have been determined to be adversely affected by the groundfish fisheries and have required protection measures in the groundfish fisheries to prevent the likelihood of jeopardy of extinction or adverse modification or destruction of critical habitat for the western distinct population segment. See section 4.5 below. All harvest specification alternatives must comply with the Steller sea lion protection measures currently implemented (67 FR 956, January 8, 2002). Further, none of the alternatives are expected to affect other marine mammals or sea birds that may be present in the GOA or BSAI. The selected alternative for setting the harvest specifications would be subject to consultation under Section 7 of the ESA if it is determined that there is the likelihood of an adverse effect on Steller sea lions or any other ESA listed species. Any reasonable and prudent alternative (RPA) would be implemented by separate rulemaking.

None of the alternatives or options are expected to have an impact on direct incidental takings of marine mammals or sea birds since there will be no significant changes in fishing practices. In all cases in the groundfish fisheries, levels of direct incidental take are low relative to each marine mammal stock's Potential Biological Removal. Two short-tailed albatross were taken in 1998 in the long-line fishery, however, this was within incidental take guidelines and did not prompt the USFWS to re-initiate consultation. The Council adopted additional seabird avoidance measures for implementation in the year 2000. Regulations at 50 CFR §§ 679.24(e) and 679.42(b)(2) contain specifics regarding seabird avoidance measures and additional measures are anticipated by the end of 2002.

Summary of Effects on Marine Mammals, Sea Birds, and Species Listed as Threatened or Endangered Under the ESA, except Steller sea lions.

Table 4.4-1 Effects of Alternatives 1 through 4 on Marine Mammals, Sea Birds, and Species Listed as Threatened or Endangered Under the ESA, except Steller sea lions.

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Option: Abolish Reserves
Incidental Catch of marine mammals, seabirds, ESA listed species (except Steller sea lions)	N	N	N	N	N
Prey availability	N	N	N	N	N
Benthic Habitat	N	N	N	N	N
Processing waste and Offal discharge (seabirds effect)	N	N	N	N	N

N = No effect

4.5 Effects on Steller sea lions

The groundfish fisheries may have direct impacts on Steller sea lions by incidental catch and entanglement of the animals during groundfish harvest and illegal shooting of the animals. Indirect effects include competition for prey species over time and space, and disturbance of the animals. These effects were analyzed in the Steller sea lion SEIS (NMFS 2001b), Section 4.1.1, for the pollock, Atka mackerel and Pacific cod fisheries. Of these effects, Alternatives 2, 3, and 4 have an unknown potential to have an indirect effect on Steller sea lions from changing the removal of prey over time in relation to biomass and Alternatives 1 and 3 have considerations regarding temporal harvest of prey species. This is further explained below under each alternative.

The Steller sea lion protection measures address in several ways the competition between the groundfish fishery and non-human predators in the marine ecosystem, which is considered by NMFS to be a potential factor in the population decline of Steller sea lions. The protection measures modify the existing harvest control rule to ensure that there are enough prey resources overall and that prey densities are sufficient to supply all competitors on a large scale. The catch of important prey species is distributed over space and time to reduce the effects of localized depletion. Localized depletion is the reduction of prey resources below a threshold necessary to effectively supply predators in a specific area during a specific time period. Fishing is prohibited in areas immediately surrounding rookery and haulout sites and fishing is curtailed for important prey species in significant portions of designated critical habitat to relieve competition in areas considered important to Steller sea lion survival and recovery. The January 8, 2002 regulations (67 FR 956) control available biomass, and temporal and spatial aspects of the pollock, Pacific cod and Atka mackerel fisheries in an attempt to reduce competition for prey species between fishermen and Steller sea lions. Additional information regarding Section 7 consultations for the groundfish fishery for Steller sea lions and all other listed species can be found in the 2001 BiOp (NMFS, 2001b, appendix A) and in the Comprehensive BiOp (NMFS 2000).

Alternative 1. Status Quo

Under Alternative 1, there is no change to the harvest specification setting process and no additional effect on Steller sea lions beyond what has already been described for the groundfish fisheries (NMFS 2001b and c), except for considerations described below regarding interim specifications.

Steller sea lion protection measures require the temporal dispersion of the fishery which is accomplished by seasonal apportionment of annual TAC. Setting the interim TAC at a level higher than is appropriate for the biomass may result in greater harvest than was intended when the Steller sea lion protection measures were enacted. Under current procedures, the interim TAC is calculated starting with the previous year's TAC for each specified groundfish species or species group. If a large change in the biomass between years has occurred, this typically would not be reflected in the interim TAC. Because of this, the interim TAC might be higher or lower than appropriate. This is of a particular concern for the BSAI and GOA pollock and Atka mackerel fisheries which have interim TAC equal to their first seasonal allowances (40, 25, and 50 percent, respectively). If the ABC has fallen between years, the interim TAC would be based on the higher ABC and the level of harvest in the first season could exceed the seasonal apportionment that is specified in final specifications.

The change in biomass and corresponding ABC would have to be quite large before what is taken during the interim period exceeds the annual TAC. In 2001 the TAC for GOA pollock was 95,875 mt. A large drop in projected biomass in 2002 resulted in TAC of 58,250 mt. If the 2001 TAC had been used to calculate the interim TAC in 2002, the interim value would have been 23,969 mt (25 % of 95,875 mt for the first seasonal apportionment). The interim 2002 TAC would have been 41percent of the 2002 TAC and would have allowed the possible exceedence of the 25 percent 2002 A season apportionment. Any overages in one season can be subtracted from the following seasons. Therefore, even in this situation where a difference of 40 percent ABC occurred between years, it would be unlikely that the annual TAC would have been exceeded if interim specifications were applied.

Even though the annual TAC is unlikely to be exceeded using interim TAC, the use of interim TAC does not ensure the appropriate seasonal apportionment of the annual TAC. In the case of GOA pollock in 2002, if the interim TAC had been used, 41 percent of the annual TAC could have been harvested during the beginning of the year, exceeding the 25 percent seasonal apportionment and concentrating the pollock harvest during a critical time for juvenile Steller sea lions. Therefore, harvest of interim specifications levels for Atka mackerel or pollock may undermine the temporal dispersion of the fisheries in times of decreasing biomass.

To avoid this potential problem with the interim TACs, the ABCs may be based on a scientifically derived value rather than rollovers of the previous year's harvest level. For example, proposed ABCs could be based on projections from the SAFE document from two years earlier. If the projection is an accurate reflection of what is known about the stocks, then it would likely result in an interim TAC that is appropriate for the known biomass. If new information indicates that the stock biomass is declining and this is not reflected in the projection from two years earlier, he or she may select either a SAFE projection or a rollover, choosing the more conservative value. Because of the flexibility in determining the proposed ABC recommendation, it is possible that the interim TACs will be set closer to a level that is appropriate to the biomass. Therefore, the potential for effects on the temporal dispersion of harvest of prey species is unknown.

Alternative 2. Proposed and Final Specifications

Under Alternative 2, the execution of the fishery will not be changed, only the process in implementing harvest specifications. There is an increased potential for setting TAC over the OFL for shorter lived species, such as pollock, compared to Alternative 1 (See analysis in section 4.1.). This potential effect may be offset by the projected overall increase in average spawning biomass and by conservative TAC amounts recommended each year by the Council. Because it is not possible to predict how the Council will set future TACs, the impact of Alternative 2 on prey availability is unknown.

The harvest levels set for this time period would be based on stock assessment data that are 16 months old, increasing the possibility that the quota being managed at that point in time may not be set optimal for the current biomass. The available biomass of Atka mackerel, Pacific cod and pollock were identified as a critical element in the Comprehensive BiOp (NMFS 2000). If the biomass had unexpectedly dropped in the time period between when harvest specifications went into effect and were fished, the removals might be higher than desirable. If more recent information indicates that the level of TAC set is too high for the biomass, regulatory action may be taken to adjust the TAC to a more appropriate level. The simulation models used in section 4.1 indicated that the fishing mortality under this alternative would be less than Alternative 1. Also, the average biomass over time would be greater than Alternative 1. This may have a beneficial effect for Steller sea lions if the additional biomass is available as prey.

No other potential direct or indirect effects on Steller sea lions or on their critical habitat are anticipated from this alternative beyond what has already been described for the groundfish fisheries (NMFS 2001b and c).

Implementation of the option for this alternative would have similar effects to those described below for Alternative 4.

Alternative 3. Issue Proposed and Final Specifications Based on an Alternative Fishing Year Schedule.
Option 1: Set sablefish TAC based on January through December schedule.
Option 2: Reschedule the December Council meeting to January

Alternative 3 may pose some difficulties in executing the fisheries in the framework of the Steller sea lion protective measures because of starting the fishing year at a later date. The Steller sea lion protection measures specify beginning and ending dates for seasonal allocations for BSAI and GOA pollock and Pacific cod and BSAI Atka mackerel. Tables 5.9-2 and 5.9-3 in Section 5.9 show that seasons for EBS pollock and BSAI Pacific cod trawl fisheries directly conflict with a July 1- June 30 fishing year. Pacific cod nontrawl fisheries are not affected because halibut PSC amounts are not apportioned during the June 10 through August 15 time period. Therefore, Pacific cod nontrawl fisheries activities would not overlap fishing years. The C season for the BSAI Pacific cod trawl fishery begins on June 10 and would over lap fishing years under Alternative 3. Adjustments to the seasons and the impacts on Steller sea lions would need to be analyzed before this alternative could be implemented. It is possible that shifting the June 10 seasonal date to July 1 would have little or no effect on Steller sea lions.[12] With a later fishing year, the end of the fishing year would be in the January-March time period, which is also a period of major activity in the Atka mackerel, Pacific cod and pollock fisheries.

The annual harvest levels set for this time period would be based on stock assessment data that are 10 months (September to July) old compared to approximately 7 months (September to February) under status quo for the beginning of the fishing year, thus increasing the possibility that the quota being managed at that point in time may not be set optimal for the current biomass. This potential is greater than with Alternative 1 (if the interim specifications are not considered), but less than with Alternatives 2 and 4. The available biomass of Atka mackerel, Pacific cod and pollock were identified as a critical element in the Comprehensive BiOp (NMFS 2000). If the biomass had unexpectedly dropped in the time period between when harvest specifications went into effect and were fished, the removals might be higher than desirable. If more recent information indicates that the level of TAC set is too high for the biomass, regulatory action may be taken to adjust the TAC to a more appropriate level. It is also likely that the biomass will be greater under this alternative than under Alternative 1 as TAC are adjusted downward to address uncertainty, as in Alternatives 2 and 4, only not as much.

Table 4.1.3 compared Alternatives 3 and 1 to show the potential effects on seasonal apportionments in conditions of falling and rising biomass. Under Alternative 3, a lag exists between the biomass information and the adjustment of TAC to reflect the new biomass level. If the changes in biomass are minor or increasing, this lag is not likely to have an effect on Steller sea lions. If the biomass rapidly drops, this may be of a concern because higher amounts of harvest may be authorized than is appropriate for the biomass level. The potential effect of this is unknown because of actions that the Council may recommend to prevent this situation from causing an adverse effect, including emergency action before the beginning of the A season fishery.

[12] Shane Capron, Personal Communication. May 16, 2002. Fisheries Biologist. Division of Protected Resources, NMFS, 709 W. 9th St. Juneau, AK 99081.

To the extent authorized under the Steller sea lion protection measures, the participants in the Atka mackerel, pollock and Pacific cod fisheries may also alter their fishing practices to "save" their fishing allocation towards the end of the fishing year, when product price is higher. This may cause excess removal rates if not carefully monitored to meet Steller sea lion protection measures.

Option 1 should have no effect on Steller sea lions since it is limited to the sablefish fishery and sablefish is not a main prey species for Steller sea lions (NMFS 2000). Option 2 may lead to better management of the target species, including Steller sea lion prey, which may indirectly benefit Steller sea lions.

Alternative 4. Biennial Harvest Specifications

The potential effects of Alternative 4 on Steller sea lions is similar to Alternative 2, only potentially more adverse if conservative Council action is not assumed. This alternative has a potential for greater variability in biomass than Alternatives 2 and 3 because of the projection of TACs from stock assessment data that are up to 28 months old. This could have an effect on Steller sea lions if future TAC are set too high for the available biomass. The possibility of setting the future TAC at a level that is too high for the biomass over time may be reduced by conservative action taken by the Plan Teams and Council in setting harvest limits. Setting of TAC at a level higher than what is appropriate for the biomass may increase competition for prey between the Steller sea lions and the commercial fisheries. Any possible effects on prey availability are likely to be short term because the Plan Teams and Council will be assessing stock conditions biennially. Any excess of amount of harvest in one year will likely lead to a downward adjustment in future harvest, if future stock assessment information indicates this is necessary. If more recent information indicates that the level of TAC set is too high for the biomass, regulatory action may be used to adjust the TAC to a more appropriate level during the biennial harvest specifications process. Also under this alternative, the average biomass over time is projected by the simulation model in section 4.1 to be greater than Alternative 1 or 2 due to reductions in fishing mortality because of uncertainty with projections. This may be beneficial to Steller sea lions if the biomass is available as prey for Steller sea lions.

The selection of either option for PSC limits has no effect on Steller sea lions because it would not effect the harvest of prey species or the interaction between Steller sea lions and groundfish fishery participants.

Option A. Elimination of TAC Reserves

This alternative should have no effect on Steller sea lions since it is only a change in regulations on the management of reserves and has no effect on the current fisheries practices or on the final level of TAC.

Because of the unknown effects of Alternatives 2, 3 and 4 on groundfish target species harvest, the effects on Steller sea lions by harvest of prey is also unknown. Action by the Council in setting TAC is a critical component to the harvest specifications and was not included in the analysis used for predicting groundfish effects. Also the analysis was compared to historical information and shown to overestimate the amount of harvest for Eastern Bering Sea pollock. Alternatives 1 and 3 also has unknown effects on the temporal concentration of harvest.

Table 4.5-1 Summary of Effects of Alternatives on Steller Sea Lions

	Alternatives			
	1	**2**	**3**	**4**
Direct Effects				
illegal shooting	**N**	**N**	**N**	**N**
Incidental take/Entanglement	**N**	**N**	**N**	**N**
Indirect effects				
harvest of prey	**N**	**U**	**U**	**U**
Spatial/temporal conc. of harvest	**U**	**N**	**U**	**N**
disturbance	**N**	**N**	**N**	**N**

N = No effect
U = unknown

4.6 Effects on Essential Fish Habitat and Benthic Communities

Direct effects from groundfish fisheries on essential fish habitat and benthic communities include the removal of organisms by fishing gear and the modification of substrate by fishing gear. Indirect effects could be the change in biodiversity from fishing activity removals or various organisms. The management areas where the fisheries take place are identified as essential fish habitat (EFH) for all the managed species listed in the fishery management plans. The proposed action would potentially involve all BSAI and GOA species noted in the environmental assessment prepared for EFH (NPFMC, 1999c). The impacts of fishing gear on substrates and benthic communities were analyzed in the draft PSEIS (NMFS 2001c), section 4.7. NMFS prepared an assessment of impacts to essential fish habitat and received a letter of consultation in reply regarding 2002 TAC specifications (Meyers 2001). In that letter, NMFS stated it concurs with the assessment that fishing may have adverse impacts on EFH for managed species but concluded that any adverse effects have been minimized to the extent practicable. No EFH recommendations were offered.

This action changes procedures for establishing harvest specifications and no effects by any alternative on EFH or benthic communities are anticipated beyond those already identified in other NEPA documents for Alternative 1. Changing temporal patterns of fishing may occur under Alternative 3, although this effect, to the extent that it occurs, would be assessed annually. Effects on EFH, target and non-target species, and associated species such as prey species, resulting from harvest specifications will be assessed annually in supporting documents for those actions.

4.7 Coastal Zone Management Act

Implementation of any of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

4.8 Effects on State Managed Fisheries

The Alaska Department of Fish and Game manages a number of fisheries in the BSAI and GOA areas. The herring, crab, and salmon fisheries are not affected by the method of setting harvest specifications[13] and will not be further analyzed in this EA/RIR/IRFA. The State fisheries which could be affected are: 1) The parallel groundfish fisheries occurring in state waters which could be affected by those alternatives which change the season opening dates; 2) The state waters seasons established for Pacific cod in the GOA and sablefish in the AI. The GHLs for these fisheries are based upon a percentage of the federal ABC, and in some areas the open season dates are determined by the closing dates of the federal seasons; 3) The demersal shelf rockfish fishery which could be effected by those alternatives which change the season opening dates; and 4) The Prince William Sound (PWS) pollock fishery. The PWS pollock fishery itself would not be affected in any manner by any of the alternatives considered. However the GHL established for the PWS pollock has a direct effect on the ABC established for the pollock fishery in the WYK/C/W area of the GOA. Specifically the GHL for the pollock fishery in PWS is deducted from the combined pollock ABC for the federal WYK/C/W area of the GOA.

The final EA prepared for the action of setting the 2002 TACs for the groundfish fisheries off Alaska analyzed the effects of setting the 2002 TACs over a range of levels on the State of Alaska state waters seasons and parallel fisheries for groundfish in section 4.9 (NMFS 2001a). The direct effect analyzed was the impact over a range of TAC levels on harvest levels in the state managed groundfish fisheries. The effects on harvest levels in state managed fisheries were all determined to be insignificant over a wide range of TACs, except for Alternative 3 which would have reduced the harvest level of Pacific cod in the state waters seasons. and Alternative 5 which would have reduced harvest levels of groundfish in the Pacific cod and sablefish in the state waters seasons and of all groundfish in the parallel seasons. Harvests in these state managed fisheries would have been reduced by more than 50 percent and the effect was deemed significantly adverse (NMFS 2001a). Each year the final EA for the annual groundfish harvest specifications analyzes the impacts of TAC alternatives on state managed fisheries.

The alternatives analyzed here are not believed to have an impact on the state managed groundfish fisheries not already considered, with the possible exception of Alternative 3, because they do not impact the manner in which ABCs, TACs or PSC limitations are set, rather the alternatives analyzed here are procedural in nature and should not change the harvest levels in state managed groundfish fisheries. Alternative 3 may have a direct impact on the management of the state fisheries because of the shifting of the fishing year, as further explained below.

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[13] Personal Communication with Herman Savikko, Extended Jurisdiction/Fishery Biologist, April 26, 2001, Alaska Department of Fish and Game, Division of Commercial Fisheries, 1255 W. 8th Street, Juneau, AK 99801

Alternative 1. Status Quo

Under Alternative 1 there would be no effects on any of the state fisheries, with the exception of the parallel state groundfish fisheries which could close prematurely if during the period the interim specifications are in effect, 25 percent of the annual groundfish TACs are harvested prior to the effective date of the final annual specifications. Such closures (if any) would be modified when the final specifications become effective. Alternative 1 has no additional direct, indirect, or cumulative effects on state managed fisheries not already considered (NMFS 2001a).

Alternative 2. Proposed and Final Specifications before start of fishing year
Option for biennial harvest specifications for GOA and AI species

Alternative 2 and the option for biennial harvest specification for the GOA and AI would not change the seasonal dates of the fisheries and therefore would have no effect on the state managed fisheries. The establishment of the PWS pollock GHL for the next year(s) would be available in a timely manner and so would have no effect on the annual or biennial establishment of the pollock ABC for the combined WYK/C/W area in the GOA. The elimination of the interim specifications would have no effect on state managed fisheries with the exception that the state's parallel groundfish fisheries (along with the federal groundfish fisheries) would not be faced with potential closures while the interim specifications are in effect. This would also be the case for Alternatives 3 and 4 which also eliminate interim specifications. Alternative 2 has no additional direct, indirect, or cumulative effects on state managed fisheries not already considered.

Alternative 3. Issue Proposed and Final Specifications Based on an Alternative Fishing Year Schedule.
Option 1: Set sablefish TAC for January through December time period.
Option 2: Reschedule the December Council meeting to January

Alternative 3 would have the greatest potential for effects on state managed fisheries of those alternatives considered. The state's parallel groundfish fisheries would be affected in the same manner as the federal groundfish fisheries discussed in section 4.1 of this EA.

Alternative 3 may have impacts on the state waters seasons for Pacific cod in management areas where the opening date is dependent upon the closing date of adjacent federal A season Pacific cod fisheries in the GOA. In 2002, those areas are the PWS, Cook Inlet, Chignik, Kodiak, and the South Alaska Peninsula areas. The state's Pacific cod fisheries in the GOA are based on up to 25 percent of the ABC for the GOA and are restricted to jig and pot gear only. Table 4.8-1 shows the end date of the State Pacific cod harvests by area and gear in PWS and the Central and Western GOA for 2000.

Table 4.8-1 Ending dates for harvest of State Pacific cod fisheries in 2000 (ADF&G, 2001)

Gear Type	PWS	Cook Inlet	Kodiak	Chignik	S. Alaska Peninsula
Pot	12/31	12/31	6/10	5/27	4/22
Jig	12/31	12/31	7/29	12/31	7/11

In 2000, the parallel seasons in state waters were concurrent with the federal seasons which had the effect of splitting the seasons in the state waters in some areas. Beginning in 2001, once the state water season opened in an area, it remained open until the GHL for that area was harvested or December 31. In 2001, PWS, Cook Inlet, Kodiak and Chignik remained open from the end of the federal fishing through December. South Alaska Peninsula annual Pacific cod fishery closed on April 8 for pot gear and June 19 for jig gear as the GHL apportionments were reached. Effort in the Chignik state waters season for Pacific cod concluded in the last week of May and effort in the Kodiak pot and jig fishery was mostly completed by the end of June. The GHLs were not reached in these areas and the fisheries remained open through December, 2001.

Under Alternative 3 the federal season for Pacific cod would not open in the GOA until September 1. There likely would not be enough time between the end of the federal fishery and the present ending date (December 31) of the State fishery to allow the GHL to be fully harvested within the one year cycle. As seen in Table 4.8-1, the state waters seasons for the Pacific cod fisheries generally extend beyond late April so that the full GHL may be harvested within the annual TAC period. With 2000 as an example, only the South Alaska Peninsula pot fishery would be able to reach its harvest allocation if the annual TAC was allocated between May 1 and April 30. If the annual time period was shifted, this may result in less harvest of Pacific cod in the state water seasons. The state waters season for sablefish in the AI opens May 15. Harvests in this fishery could also be reduced by a change in the dates of the annual fishing year unless Option 1 is also adopted.

Table 4.8-2 shows the amount of harvest that may be lost with the shift in fishing year under Alternative 3. The values are an over estimation of the net value because of the cost of harvesting the fish is not considered. This loss of harvest may create economic hardship for those that depend on the spring season State Pacific cod fishery and create State management difficulties.

Table 4.8-2 Amount in gross value of State P. cod harvested during State Waters Seasons in the ADF&G Westward Region April 30 to July 1 by area in 2000

Gear Type	Kodiak	Value*	S. Alaska Peninsula	Value	Chignik	Value*
pot	211.5 mt	$285,377	na	na	276.5 mt	$373,081
jig	961.4 mt	$1,297,217	226.6 mt	$305,751	na	na

* based upon $1,349.30 per round wt. mt of pot catcher processor wholesale value in the second half 1999 (Hiatt, 2001).

During 2001, the State Board of Fish (BOF) reviewed issues related to state and federal management of Pacific cod fisheries, including the state waters seasons and parallel state fisheries. For the 2002 season the BOF established an opening date for the Chignik District state waters Pacific cod season of March 1, 2002. This action was taken primarily to insure that participants in the fishery would have a greater opportunity to harvest the GHL. If Alternative 3 were implemented, it would likely result in the BOF adjusting the season dates and possibly other management measures for the state waters seasons for other areas in the

GOA and sablefish in the AI as well. While such actions could mitigate the adverse effects on the state waters Pacific cod seasons in the GOA and AI it would entail additional administrative costs to the State.

The State also manages the demersal shelf rockfish (DSR) fishery in the GOA based on an annual TAC allocation. During the calendar year, a small amount of directed fishing for DSR is allowed until the opening of the halibut and sablefish IFQ fisheries approximately March 15. DSR is then placed on bycatch for the remainder of the IFQ fishery until November 1 so that the halibut fishery will not be constrained by DSR bycatch. After closure of the IFQ fishery, the DSR directed fishery may be reopened to finish harvest of the remaining TAC.

With a shift in the fishing year under Alternative 3, the State would be unable to determine how much directed fishing would be allowed for DSR until after the closure of the IFQ fisheries in November. The DSR directed fishery would have to be limited to the time period between November 1 and approximately March 15. This may cause difficulty in the DSR directed fishery if participants need to know what amount they can harvest for planning purposes at the beginning of the calendar year.

Option 1 to set the sablefish TAC on a January through December schedule would eliminate the potential effects on the State sablefish fishery and DSR fishery described above.

Under Alternative 3, the effects on the state's parallel groundfish and DSR fisheries are unknown due to potential changes in fishing effort seasonally and spatially, the potential effects could be mitigated by Council action in setting directed fishing seasons and PSC apportionments for the federal groundfish fisheries which would likewise affect these state managed fisheries. The impacts on the state waters seasons for Pacific cod are also unknown as potential adverse effects could be mitigated by BOF action to adjust season opening dates and other management measures. Under Alternative 3 the annual GHL established for the PWS pollock fishery would have no effect on the federal pollock fishery in the WYK/C/W area of the GOA. In summary the direct, indirect, and cumulative effects on state managed fisheries under Alternative 3 are unknown.

Option 2 may have an indirect beneficial effect on State fisheries, if the additional time provided scientist results in improved management of target species stock.

Alternative 4. Use Stock Assessment Projections for Biennial Harvest Specifications. For the BSAI and GOA set the Annual Harvest Specifications Based on the Most Recent Stock Assessment and Set Harvest Specifications for the Following Year Based on Projected OFL and ABC Values.

Option 1: Set PSC Limits Annually

Option 2: Set PSC Limits Every Two Years Based on Regulations and Projected Values or Rollovers

Alternative 4 would have the same impacts on the state's parallel groundfish fisheries, the DSR fishery, and the state waters seasons for Pacific cod as on federal groundfish fisheries discussed in Section 4.1 of this EA. The State conducts biennial surveys of the pollock resource during the summers months of odd numbered years, most recently in 2001. The assessment results become available later in the year to establish GHLs for the next two years, most recently 2002 and 2003. If Alternative 4 were adopted to begin setting the TACs in an even numbered year then the ABCs for the WYK/C/W area of the GOA would not be effected. If Alternative 4 were adopted to begin setting the TACs in an odd numbered year then ABCs and TACs for the area would need to be adjusted between the publication of the proposed and final specifications once every two years if the GHL for the pollock fishery were to change. This would likely be a minor adjustment as the PWS pollock GHL has recently averaged 2 percent of the WYK/C/W area ABC. Changes in the GHL have averaged less 1 percent of the WYK/C/W area ABC between assessments. Alternative 4 and its options for setting PSC limits would have no additional direct, indirect, or cumulative effects on state managed fisheries not already considered (NMFS 2001c).

Option A: Abolish TAC Reserves

This option would have would have no additional direct, indirect, or cumulative effects on state managed fisheries not already considered because it has no effect on fishing practices or the amounts of harvest.

Table 4.8-3 Effects of Alternatives 1 through 4 on Harvest Levels in State Managed Groundfish Fisheries

Fishery	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Option A: Abolish Reserves
Pollock PWS (SWS)	N	N	N	N	N
Pacific cod GOA (SWS) Sablefish AI (SWS)	N	N	U	N	N
DSR in SEI	N	N	U	N	N
Parallel Seasons in BSAI and GOA	N	N	U	N	N

N = No effect, U = Unknown SWS = State Waters Seasons

4.9 Effects on the Sablefish and Halibut IFQ and Halibut CDQ programs

Alternative 3 is the only alternative that may have an impact on these programs by shifting the fishing year to start in July. Pacific halibut and sablefish IFQs and CDQ halibut are harvested under an individual fishing quota program managed by NMFS. Since the start of the program in 1995, the harvest time period under these programs has been mid March through mid November, established annually by the IPHC for halibut and adopted by NMFS for the sablefish fishery. These fisheries are conducted concurrently to reduce the amount of discard for both species and for fishing efficiency. Conducting both fisheries at the same time also reduces the resource needs for NMFS Enforcement and Restricted Access Management. The International Pacific Halibut Commission (IPHC) is currently analyzing the potential to change or extend the halibut retention season.

NMFS requires approximately six weeks to conduct an administrative permit process before fishing can occur under any new or revised TAC allocation, regardless of when an allocation becomes effective. Currently, NMFS uses the time period between the end of the fishing year (December 31) and the start of the IFQ season (mid March) to perform a number of management steps. These steps include: 1) establish final TACs, 2) stabilize accounts (landings completed, corrections made and quota transfers are stopped), 3) calculate, print, and mail permits, 4) allow for fair start, and 5) collect IFQ fees. TAC setting requires review and publication in the Federal Register for sablefish, and Governmental approval and publication of the halibut regulations established by the IPHC for halibut. The permit calculation process cannot start until all fishing has stopped and the IFQ accounts are stable because new year's permits are a function of the final account balances from the previous permits. Halibut may not be retained, and directed fishing for IFQ sablefish stops, in mid November although sablefish bycatch which accrues against IFQ permits occurs through December. Some vessels, especially larger freezer vessels, may take 2 to 3 weeks before completing their last landings after the close of the fishery. After landings are completed and information is stable, NMFS calculates overages and underages which apply to next year's IFQ accounts; and also distributes the new TAC to all current quota share holders. New year IFQ permit calculations are completed on or about January 31 at which time the printing and distribution steps begin. The participants in the IFQ fisheries normally are mailed their permits in February so that permits can be received and all participants, even those in remote locations, are able to participate on the opening date of the fishery, which historically has yielded the highest exvessel prices. The processes of implementing TACs, account stabilization; calculating, printing, issuing, and mailing permits; and collecting fees, takes approximately six weeks of time when no fishing may occur between the fishing years. This intermission is also needed to implement revised reporting and recordkeeping requirements and new electronic reporting software; to issue registered buyer permits, and to process IFQ leases and hired skippers applications.

If Alternative 3 was implemented, the annual TAC would be established to be effective with the new fishing year, in July. The "intercession" period would have to occur just prior to that, at a time when the fishing weather and opportunity was best; and the safety issues at a minimum. If the sablefish season were intended to start concurrent with the halibut season in March just after a closed period, there would be two periods during the year in which no sablefish could be harvested. If the sablefish season were not concurrent with the halibut IFQ (and CDQ) season, waste and discard of halibut would occur in the sablefish fishsery; and of sablefish in the halibut fishery. In particular, it is undesirable to allow sablefish fishing in winter, when halibut are deep and have a much more spatial overlap with sablefish, increasing halibut bycatch potential[14]. While the sablefish fishery dates can be adjusted by NMFS with the Council's recommendation, halibut fishing seasons are established by the IPHC and may not coincide with any changes made to the sablefish fishery.

It is possible that the IFQ permits could be issued on the proposed TAC rather than the final TAC. If the TAC and/or area allocations changed between the proposed and final rulemaking and new permits would need to be processed and issued. This is the worst possible scenario due to the potential for two sablefish permitting processes in one year and the additional down time that would be required. There also is a potential for exceeding a quota if the final annual TAC decreased, yet fishing in excess of that had already

[14]Gregg Williams, Senior Biologist, Personal Communication, April 25, 2002, International Pacific Halibut Commission, P.O. Box 95009, Seattle, WA 98145-2009, U.S.A.

occurred. There is also a potential for exceeding an area allocation or even the entire TAC if by the time the final annual TAC was known to decrease, fishing in excess of that amount had already occurred.

Under the current IFQ program, a number of regulation changes may mitigate some of the difficulties of having inadequate time for intercessions between different allocation periods. Multiyear permitting and other program changes could reduce the time needed, or reduce the frequency of stand down periods. Numerous regulation changes may also be made such as: shifting cost recovery program reporting and payment schedules, adjusting the date before which IFQ permits may not be calculated, and revising logbook submission dates. Removing the provision for applying overages and underages to the following year's IFQ permits would mean the following year's IFQ permits could be calculated based solely on quota shares held and the new year's TACs; only transfer activity would need to halt temporarily. If Alternative 3 was implemented, significant management and regulation changes to the IFQ program would be necessary to ensure the sablefish and halibut IFQ programs are implemented concurrently, fairly, and with little disruption.

Option 1 to Alternative 3, setting sablefish TAC on a January through December schedule, would allow NMFS to manage the sablefish IFQ fishery consistent with the halibut IFQ fishery. Option 1 would result in no effect from Alternative 3 on the Pacific halibut and sablefish IFQ and CDQ halibut programs. Option 2 would also have no effect since it only deals with the timing of the Council meeting for final harvest specifications recommendations.

4.10 Effects on the American Fisheries Act Fisheries

An EIS analyzing the impacts of the AFA fisheries was completed in the February 2002 (NMFS 2002). Section 2, Alternative 3 of the AFA EIS describes the action proposed to manage the AFA fisheries (66 FR 65028, December 17, 2001). A final rule is expected to be published in the summer of 2002.

Under the AFA, close to 100 percent of the BSAI directed pollock fishery has been allocated to fishery cooperatives. In all three sectors of the BSAI pollock fishery, cooperatives function as a form of privately-operated individual fishing quota program. Within each cooperative, member vessels are granted an allocation of pollock based on their catch history and are free to lease their quota to other members of the cooperative, or acquire quota from other members to harvest. The catcher/processor and mothership sector cooperatives operate at the sector level in that NMFS makes a single allocation to the sector and the cooperatives are responsible for dividing up the quota among individual participants in the sector. Inshore sector cooperatives are organized around each processor and NMFS makes individual allocations to each cooperative rather than to the inshore sector as a whole.

Alternative 1. Status Quo

The AFA cooperative pollock fishery has been operating under the no-action alternative since 1999 in the catcher/processor sector and since 2000 in the inshore and mothership sectors. While cooperatives have been able to form and function under the no-action alternative, the ability of cooperatives to establish efficient markets for pollock quota has been hampered, to some extent, by the lack of certainty about quotas prior to the start of the fishing year. In 2000 and 2001 NMFS started the fishing year under interim pollock TACs which meant that cooperative allocations also were issued on an interim basis. This meant that each cooperative member had some degree of uncertainty about the total value of his pollock allocation in metric tons. While cooperative members started the fishing season with the knowledge of the Council's final TAC recommendations from its December meeting, they did not have absolute certainty that NMFS would ultimately implement the Council's recommendations, especially given the uncertainty surrounding Steller sea lion management measures.

Alternative 2. Proposed and Final Specifications before start of fishing year
Option for biennial harvest specifications for GOA and AI species

Alternative 2 would represent an improvement over the no-action alternative because final annual co-op allocations could be established prior to the start of the fishing year. Co-op members would have greater certainty that pollock quota leased prior to the start of the fishing year would actually represent quota that could be harvested during the fishing year. As a general rule, greater advance notice of final TAC amounts will result in greater efficiency in the cooperative markets in pollock quota. Implementation of the option to this alternative would have no effect beyond those without the option.

Alternative 3. Issue Proposed and Final Specifications Based on and Alternative Fishing Year Schedule.
Option 1: Set sablefish TAC on a January through December schedule.
Option 2: Reschedule the December Council meeting to January

Alternative 3 would have mixed effects on the management of the AFA pollock fishery. On the one hand, final pollock quotas would be established prior to the start of any pollock fishing which should lead to greater efficiency in cooperative management. However, changing the fishing year would have greater effects on the AFA pollock management regime which is currently based on the calendar fishing year. Adoption of Alternative 3 would affect existing regulations that establish application deadlines for AFA pollock cooperatives and reporting deadlines for annual co-op reports. Initially these changes would be more disruptive than adoption of Alternative 2. Option 1 to this alternative would have no effect because it is limited to the sablefish fishery. Option 2 would provide less time to the AFA pollock industry for planning before the fishing year, but it is unlikely that there would be an effect on the industry with a planning time period reduction from 6 months to 5 months.

This alternative also has the potential to effect the capability to harvest pollock during the B season. Less time will be available in the B season, which may be a problem in years of high TAC. This is covered in more detail in section 5.9 of this document.

Alternative 4. Use Stock Assessment Projections for Biennial Harvest Specifications. For the BSAI and GOA set the Annual Harvest Specifications Based on the Most Recent Stock Assessment and Set Harvest Specifications for the Following Year Based on Projected OFL and ABC Values.

Given that the harvest specifications setting process under Alternative 4 would follow the same schedule as Alternative 2, the effects on the AFA pollock fishery are likely to be the same as for Alternative 2. Implementation of Options 1 or 2 would have no effect on the AFA fisheries because the options affect PSC limits only.

Option A. Abolish TAC Reserves

The AFA provides for the full allocation of the pollock TAC, and therefore, this option will have no effect on the AFA fisheries.

4.11 Summary of Environmental Impacts and Conclusions

To determine the significance of impacts of the actions analyzed in this EA, NMFS is required by NEPA and 50 CFR § 1508.27 to consider the following:

Context: The setting of the action is the groundfish fisheries of the BSAI and GOA. Any effects of the action are limited to these areas. The effect on society within these areas is isolated to the direct and indirect participants in the groundfish fisheries of the BSAI and the GOA. The proposed action has no major changes to fishing practices nor to total allowable harvest amounts and management measures, only administrative changes to the process of setting harvest specifications.

Intensity: A listing of considerations to determine intensity of the impacts are in 50 CFR § 1508.27 (b) and in NOAA Administrative Order 216-6 Section 6. Each consideration is addressed below in order as it appears in the regulations and administrative order.

1. Beneficial and adverse impacts are required to be considered in this action. Environmental components that may be affected by this action include groundfish target species, prohibited species, Steller sea lions, State and AFA fisheries. Retrospective and simulation analyses on the effects of Alternatives 2 and 4 on target species indicated that the level of catch for several groundfish species is likely to decrease but the potential for exceeding the overfishing level is likely to increase compared to the Status Quo. Alternative 3 would likely have an effect between the potential effects from Alternative 1 and Alternative 2. Because the analyses did not take into account mitigation factors such as the Council process and the OY limit for the BSAI, it is unknown if Alternatives 2 through 4 will have an adverse effect on groundfish target species and component of the environment that depend on groundfish target species, such as Steller sea lions. Further, specific impacts resulting from the harvest specifications would be assessed annually in a NEPA document.

Alternative 3 (change in fishing year) could alter fishing patterns which has unpredictable results for the groundfish and State fisheries and may pose difficulties to the BSAI pollock fisheries in times of high TAC regarding meeting the B season allocations and potential higher salmon bycatch levels. However, those changes would be assessed in an annual EA that accompanies the harvest specifications. The Council, State and industry may be able to modify fishing management measures and practices lessening the potential effects of shifting the year and seasons, and in the pollock fishery to ensure full harvest of the B season TAC, and avoid high salmon bycatch. Option 1 to Alternative 3 would remove potential effects on the sablefish IFQ and halibut fisheries.

Because the harvest of groundfish species may have an indirect effect on Steller sea lions, it is also unknown if Alternatives 2 through 4 may have an adverse impact on Steller sea lions. The harvest of groundfish under Alternatives 1 and 3 may not be temporally dispersed as required by Steller sea lion protection measures, if new information indicates that the biomass is less than expected. If adverse effects are expected, emergency rule making can be used to adjust the harvest to a more appropriate level, therefore the potential effect is unknown.

None of the considered alternatives is expected to have an adverse impact on essential fish habitat or on other ESA listed species because regulations currently exist that control fishing effort and practices to mitigate adverse impacts on listed species. No significant impacts are expected on marine mammals, seabirds and ESA listed species, other than Steller sea lions, for Alternatives 1 through 4 beyond those already identified in previous NEPA analyses.

No effects are expected from Option A, to eliminate certain TAC reserves.

2. Public Health and Safety: All alternatives, except Alternative 3, have no new, additional effects on public health and safety. Alternative 3 during years of high TAC for pollock, has the potential to shift fishing activities into October as the industry attempts to harvest all of the B season allocated pollock. The industry may be able to concentrate harvest in the July 1 through August 31 time period to avoid fishing in deteriorating weather in October and therefore the effect on safety may be avoid.

3. This action takes place in the geographic areas of the Bering Sea, Aleutian Islands and Gulf of Alaska. Even though these areas contain cultural resources and ecologically critical areas, no effects on the unique characteristics of these areas are anticipated to occur with any alternative considered with this action.

4. This action may or may not be controversial depending upon which alternative is chosen and level of public concern. At this time a preferred alternative is not identified.

5. The risks to the human environment by implementing the BSAI and GOA groundfish fisheries are described in detail in the PSEIS (NMFS 1998a) and in the draft PSEIS (NMFS 2001c). Because the action analyzed in this EA is an administrative process, conducted consistently with the Steller sea lion protection measures, and does not change basic fishing practices, there are no additional known risks to the human environment, beyond those already analyzed, by taking this action.

6. Future actions related to the setting of harvest specifications may result in significant impacts on the groundfish fisheries and environment. The setting of specifications is an annual process that includes a NEPA analysis with each regulatory action. NMFS has released for public review and comment a draft PSEIS to address the BSAI and GOA groundfish fishery FMPs Future EAs analyzing the setting of harvest specifications will be tiered from this PSEIS once it is finalized.

7. Cumulatively significant impacts are unknown to result with this action because all components of the environment have no known effects from the alternatives and options, beyond those already analyzed. Cumulative effects are those effects that may result from the action and any past, present, or reasonably foreseeable future actions. Cumulative effects may occur if a direct or indirect effect from an action is identified. The harvest specifications process is an annual or biennial process under the alternatives in this EA/RIR/IRFA. Reasonably foreseeable future actions are the continued Federal and State groundfish fisheries. Past actions include the foreign fleet fisheries and other fisheries in the BSAI and GOA. Present actions include the State fisheries as described in Section 4.8. Details of cumulative impacts of the groundfish fisheries are in Section 4.13 of the draft PSEIS (NMFS 2001c).

Section 4.13 of the Steller sea lion SEIS (NMFS 2001b) contains detailed information on cumulative effects of the Steller sea lion protection measures on the human environment. Alternative 4 in the Steller sea lion SEIS is similar to the current groundfish management regime that would be implemented by the process described in each alternative in this EA/RIR/IRFA. Conditionally significant negative cumulative effects identified with Alternative 4 in the Steller sea lion SEIS include: removal and damage of habitat of particular concern (HAPC) by mobile and fixed gear and substrate modification, spatial and temporal prey removal for Steller sea lions, benthic biodiversity, introduction of nonindigenous species and various socioeconomic effects.

8. Because this is primarily an administrative process, this action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources. This consideration is not applicable to this action.

9. NEPA required NMFS to determine the degree an action may affect threatened or endangered species under the ESA. The only ESA listed species that may be adversely affected by the proposed action Steller sea lion. Alternatives 2 through 4 may affect available biomass of prey species. Alternatives 1 and 3 may affect the temporal dispersion of harvest of prey species. Alternative 1 uses interim specifications during the early part of the fishing year which are based on two year old data. New information available immediately before the commencement of the interim fishery may indicate that the interim harvest levels are not appropriate for seasonal allocation of the annual TAC. The interim value could be adjusted through emergency action if adverse effects on Steller sea lions is anticipated based on new information showing less biomass.

Alternative 3 may posed some difficulties in executing the fisheries in the framework of the Steller sea lion protective measures because of starting the fishing year at a later date. Steller sea lion protection measures specify beginning and ending dates (June 10) for seasonal allocations for BSAI pollock and Pacific cod trawl in a way which may conflict with beginning a fishing year, July 1. With a later fishing year, the end of the fishing year would be in the January-March time period, which is also a period of major activity in the Pacific cod and pollock fisheries. To the extent authorized under the current Steller sea lion protection measures (67 FR 956, January 8, 2002), the participants in the pollock and Pacific cod fisheries may also alter their fishing practices to "save" their fishing allocation towards the end of the fishing year, when it is most profitable. This may cause localized depletion if not carefully monitored to meet Steller sea lion protection measures.

The available biomass of Pacific cod, Atka mackerel, and pollock were identified as a critical element in the Biological Opinion for the 2002 groundfish fisheries and Steller sea lion protection measures. Under Alternatives 1 through 4, the annual harvest levels would be based on stock assessments using data from 7 to 28 months earlier than the fishing year, increasing the possibility that the TAC may not be set at an appropriate level for the current biomass. If information indicates that the biomass is unexpectedly lower in the time period between setting TAC and commencement of the fishing year, harvest levels may be set too high for the current biomass. TAC set too high for the biomass may increase competition between the Steller sea lions and commercial fisheries. Because the final levels of TAC are dependent on several mitigating factors not taken into account in the analysis used to predict effects on groundfish biomass, it is not possible to know if the predicted concerns from the groundfish effects analysis described above may actually occur. The Division of Sustainable Fisheries is currently consulting with the Division of Protected Resources on the potential adverse effects on listed species that may result from the implementation of Alternatives 2 through 4.

10. This action poses no known violation of Federal, State, or local laws or requirements for the protection of the environment. Section 1.3 describes the legal consideration of tiering this EA off of the PSEIS for the groundfish fisheries (NMFS 1998a). A draft PSEIS (NMFS 2001c) for the BSAI and GOA groundfish fisheries FMPs is available for public review and is a revised draft is expected to be release in the Fall 2002.

11. This action poses no effect on the introduction of nonindigenous species into the BSAI and GOA because it involves the change of an administrative process and not actual fishing practices that may lead to the introduction of nonindigenous species.